Chapter 1: Unit Conversion Lab

Overview:

Although unit conversions can sometimes be boring, there's an easy way to spice them up. With this simple lab you'll give students a chance to do some unit conversions without a worksheet.

Estimated time to complete this lab: 45 – 60 minutes

Equipment:

- Station 1: Unsharpened pencil and ruler that measures centimeters.
- Station 2: Electronic or triple-beam balance and paper clip.
- Station 3: 10 mL graduated cylinder, very small beaker (20 mL, if available), and 1 liter of tap water.
- Station 4: Thermometer that measures temperature in degrees Celsius.
- Station 5: Stopwatch or wall clock that can measure seconds.
- Station 6: A rectangular paper towel and ruler that measures centimeters.

About the lab:

This lab consists of six stations. At each station the students will take measurements of everyday items. However, there's a twist. Instead of simply making the desired measurements, your students will convert these measured values to less familiar units. In some cases they will be required to convert between different metric units and in other cases they will be required to convert between metric and English units. When they finish this lab, your students should be able to do unit conversions for real-world measurements and not just when solving worksheets.

Students enjoy this lab simply because of the inherent silliness involved with measuring everyday items and events in unusual units. They will be motivated to work on this lab not because they love unit conversions but because they'll be curious to see how long they can hold their breath in years. Teenagers are, by nature, fairly silly. Tapping into this silliness motivates students far more than many other traditional classroom management strategies.

What can go wrong:

- Some of the things being measured get lost. Have several spare pencils, paper clips, and paper towels on hand in case they wander away.
- The students don't know how to use the measuring devices. I've never seen this to be a problem when working with a ruler, but it will occasionally cause trouble for students unfamiliar with using a triple beam balance. Time spent teaching your students how to use unfamiliar equipment is time well spent.

- The measuring devices break. This happens frequently with thermometers and anything electronic. Make sure you have working spares of all measuring devices used in this lab. If you use probeware, it's a good idea to make sure that you have at least twice as many working probes as you need.
- Your students will have problems with Station 6, where they find the area of a paper towel in square meters. This is because area is a derived unit rather than one that can be directly measured. It may make the lab easier if you suggest that your students convert centimeters to meters *before* they find the area of the towel, rather than after.

Answer key:

There isn't a set solution key for this lab because every item your students will be measuring has a unique mass, volume, length, and so on. However, here are some easy conversion factors that should make grading easier:

- Station 1: Multiply the length of the pencil in centimeters by 6.21×10^{-6} to find its length in miles.
- Station 2: Multiply the mass of the paper clip in grams by 1.10×10^{-6} to find its mass in tons.
- Station 3: Multiply the volume of the beaker in milliliters by 2.60×10^{-4} to find its volume in gallons.
- Station 4: Add 273 to the temperature of the armpit in degrees Celsius to find the temperature in Kelvins.
- Station 5: Multiply the time your student can hold his/her breath in seconds by 3.20×10^{-8} to find the time in years.
- Station 6: Students will need to convert centimeters to meters before multiplying the length of the towel by the width. To find the area of the towel in square meters, multiply the area of the towel in square centimeters by 1.0×10^{-4}.

Handy tip for new teachers:

Your stapler, hole punch, and other equipment will be less likely to wander away if you engrave your name or room number on it. Unlike labels, engraving your name on an item permanently marks it as yours. Engraving tools are very easy to use and available at most hardware stores.

Unit Conversion Lab

Use unit conversion calculations to answer each of the following questions. Show your work for each calculation.

Station 1: Length of a pencil

Find the length of the pencil in miles. There are 1.6 kilometers in a mile.

Station 2: Mass of a paper clip

Find the mass of the paper clip in tons. There are 2.2 pounds in a kilogram and 2000 pounds in a ton.

Station 3: Volume of a very small beaker

Find the volume of the beaker in gallons. There are 0.26 gallons in a liter.

Station 4: Temperature of your armpit

Find the temperature of your armpit in Kelvins. The temperature of a substance in Kelvins is equal to its temperature in Celsius plus 273.

Station 5: Length of time you can hold your breath

Find the maximum length of time you can hold your breath, in years. There are 365 days in one year.

Station 6: Area of a paper towel

Find the area of a paper towel in square meters.